

ECH₂O Tec.

Watermakers

PRO SERIES

SEMI MODULAR BULKHEAD MOUNT UNIT

115V / 60HZ - 230V / 60HZ

500-PRO-1 / 900-PRO- 2

1200-PRO- 3 / 1500-PRO- 4

OWNERS MANUAL

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INTRODUCTION

Thank you for choosing an ECHO Tec. reverse osmosis desalination system. We trust that you will be completely satisfied with our product.

The purpose of this manual is to allow you to become familiar with each component of your new ECHO Tec. desalination system.

By understanding the function, importance and normal operation of each part in the system, the operator can readily diagnose problems when they first develop. Such problems are easily corrected and require minor adjustments. If left unattended, a small problem in one component will affect the rest of the system and can lead to an expensive repair.

If you have any doubts or questions, please contact us.

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SPECIFICATIONS

Rated Performance:

ECHO Tec:	500 – PRO – 1	20 gallons – 75ltr. / hour
	900 – PRO – 2	38 gallons – 140ltr. / hour
	1200 – PRO – 3	50 gallons – 210ltr. / hour
	1500 – PRO – 4	60 gallons – 260ltr. / hour

Reverse Osmosis performance varies with the feed water temperature and salinity. The rated performance is tested at 26°C / 80°F water temperature at a salinity of 35g/l. A decrease in product water quantity of 10 to 15% in the first year is normal and expected.

RO Membrane Type:

Standard size high rejection TFC Polyamide, thin film composite, spiral wound, single pass reverse osmosis element.

Salt Rejection: min. 99.5%

Salinity Range- System 500 / 900: up to 50,000 ppm TDS (NaCl)
1200: up to 40,000 ppm TDS (NaCl)
1500: up to 36,000 ppm TDS (NaCl)

PH Range: 4 – 11

Chlorine Tolerance: 1000 ppm hours

Operating Pressure: 800 psi (continuous duty)

Feed Water Pressure: 0 to 60 psi

Feed Water Temperature Range:

min. 33°F / 0.5°C, max 113°F / 45°C

Electrical Power Requirements:

115 V / 60Hz 18.4 amps 230 V / 60Hz 9.2 amps

Safety Switch Off Functions:

- 1) High RO pressure: above 1000 PSI
- 2) Low high-pressure pump feed pressure: below 1.5 PSI
- 3) High product salinity (optional)

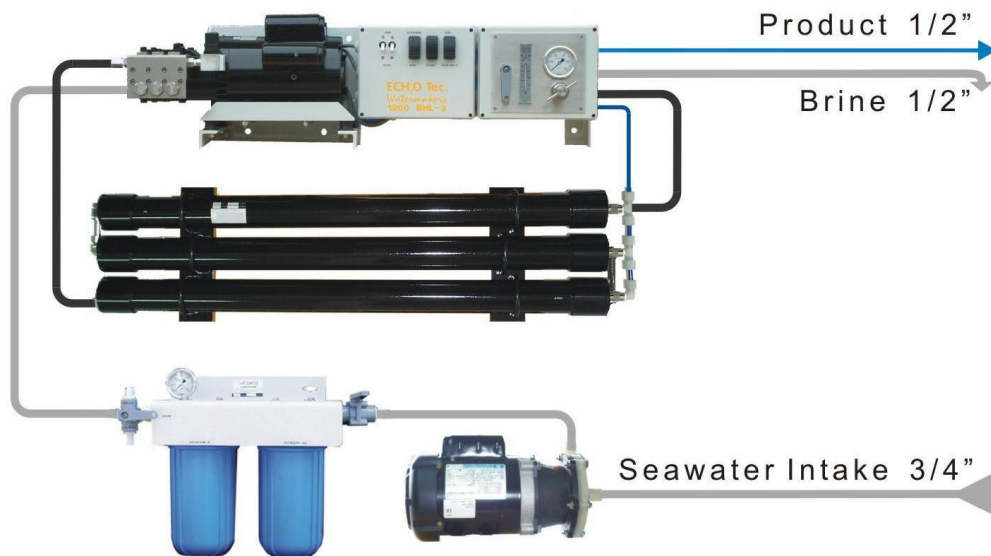
STANDARD SYSTEM FEATURES

- 1) **1 High-pressure pump unit** with controls
- 2) **Pressure vessel rack with reverse osmosis membrane vessel(s)**

ECH ₂ O Tec.	500-PRO-1	one	40" vessel
	900-PRO-2	two	40" vessels
	1200-PRO-3	three	40" vessels
	1500-PRO-4	four	40" vessels
- 3) **2 Filter housings** with bracket and 5 and 20 micron pre filter cartridges
 - 1 Storage/cleaning valve with 3/4" and 1/2" hose barbs
 - 1 Shut off valve with 3/4" hose barb
 - 1 Filter wrench
- 4)
 - 6 feet / 2 meter 1/2" reinforced vinyl hose (reject, product, flush)
 - 10 feet / 3 meter blue product water tubing (system to tank connection)
 - 10 feet / 3 meter 3/4" reinforced vinyl hose (pre-filter to high pressure pump)
 - 3 feet / 1 meter 5/8" service intake hose

3 + 2 feet / .9 + .6 meter high pressure hose with fittings (500-PRO-1)
2 + 6 feet / .6 + 1.8 meter high pressure hose with fittings (900-PRO-2)
3 + 2 feet / .9 + .6 meter high pressure hose with fittings (1200-PRO-3)
2 + 6 feet / .9 + 1.8 meter high pressure hose with fittings (1500-PRO-4)
Vertical systems come with high pressure hoses installed.
- 5)
 - 6 1/2" Stainless steel hose clamps
 - 1 5/8" Stainless steel hose clamp
 - 2 3/4" Stainless steel hose clamps
- 6) **1 Hardener / pH neutralizer kit** with mineral element and 2pcs 3/8" compression fittings
 - 1 Stainless steel bracket with 8 screws
- 7)
 - 1 Handheld TDS Meter
- 8)
 - 1 Biocide, 1 acid cleaning solution, 1 alkaline cleaning solution
- 9)
 - 1 Owners Manual

INSTALLATION INSTRUCTIONS



HIGH PRESSURE PUMP UNIT

Mount the high pressure pump unit in a cool and dry location using all five mounting holes.

The electrical installation should only be done by a professional electrician. Check the correct voltage before installing the system.

The cable labeled with the system's voltage and frequency is to be connected to the power supply. The cable marked "FEED PUMP" is to be connected to the seawater feed pump or should be insulated / removed where pressurized seawater is available.

MEMBRANE VESSEL RACK

Mount the high-pressure membrane vessels with the provided brackets below the high pressure pump unit. Vertical mounting is possible if space is limited but you will need to order different high pressure hose lengths.

The membrane is sealed within its housing by plugs at both ends. Inside is a small amount of preservative to keep the membrane moist and prevent bacterial growth.

The shelf life of the preservative, under best conditions, is one year. We recommend you install and use your watermaker as soon as possible.

When all other components and hoses/pipes are completely assembled, remove the caps on the high pressure fittings and the blue sealed tube from the product water outlet on the membrane housings and then finish making all final hose/tube connections. This will insure that the membrane is kept moist.

SEAWATER FEED PUMP (Optional equipment)

Mount the feed pump in a dry location below water level. Install a sea strainer to protect the feed pump. Connect the intake of the feed pump with a sea strainer and the sea strainer with the vessel's sea cock using 3/4" wire coil reinforced hose. Avoid elbows/90 degree fittings in your plumbing. The complete pump head can be turned in case the outlet direction is not suitable for your installation.

PRE-FILTER ASSEMBLY

Mount the pre-filter in a serviceable location and connect the intake port to the outlet of the raw water feed pump or multi-media sand filter (optional). For short runs, use 5/8" reinforced PVC hose. For longer runs, use a 5/8" or 3/4" PVC pipe. Connect the outlet of the pre-filter housing with a 3/4" reinforced PVC hose to the intake of the high pressure pump. **Install all plumbing to eliminate any air pockets in the system.**

HIGH PRESSURE HOSE

Never bend the high pressure hose tighter than a 4"/10cm radius.

Run one of the high-pressure hoses from the outlet of the HP pump (O ring sealed fitting) to the O ring sealed fitting at the end of the membrane that is marked "IN".

A minimum hose length of 3 feet / 1m is required for pulsation dampening. The hose can be coiled where needed.

Run the second high-pressure hose from the flow control box to the O ring sealed fitting at the end of the membrane that is marked "OUT".

CAUTION: WHEN CONNECTING THE HIGH-PRESSURE HOSE TO THE MEMBRANE HOUSING(S), AVOID OVERTIGHTENING. THE FITTING IS O-RING SEALED AND DOES NOT REQUIRE MUCH TORQUE.

PRODUCT WATER TUBING

Connect the blue product water tubing (for longer runs than 10ft / 3m on the models 1200 and larger, use a 1/2" PVC hose or pipe) from the center fittings of the membrane housing(s) to the inlet of the flow control panel. Connect the tubing or hose from each output port of the flow control panel to your fresh water storage tank/s and to a taste/test station of your choice.

Do not allow the product line to become blocked while the system is running. It must be avoided that chlorinated water from your storage tanks can flow back into the RO membranes. Therefore, the product discharge must be above the tank's waterline.

HARDENER / pH NEUTRALIZER KIT

Install the hardener / pH neutralizer housing at a serviceable location in line with the product water tubing from the diverter valve on the control panel to the freshwater storage tank. Observe the flow direction indicated on the housing.

REJECT WATER TUBING/HOSE

Connect the outlet of the pressure control valve on the back of the flow control panel with a 1/2" reinforced PVC hose to a thru hull preferably above the waterline.

FRESH WATER FLUSH FILTER

Install the fresh water flush filter housing at a location near the seawater pre-filter assembly. Connect the flush port of the three-way service valve at the pre-filter assembly with the outlet of the flush filter housing (OUT). Supply pressurized fresh water to the shut off valve of the flush filter housing.

SYSTEM OPERATION INSTRUCTIONS

The reverse osmosis membrane contains a preservative solution to prevent microbiological growth. If ingested, may cause irritation of the gastro-intestinal tract, colic, diarrhea, or other similar symptoms.

Therefore, discard all the product water for at least thirty minutes of initial operation or after storage before drinking or use in food preparations!

Do not operate the system using contaminated feed water sources (oil, chlorine or other chemicals).

Have you filled the high-pressure pump with the proper amount of oil (SAE90 gearbox oil)?

- 1) Open the seacock and the seawater shut off valve on the pre-filter assembly.
- 2) Open the pressure control valve on the flow control panel all the way, counter-clock wise.
- 3) Set the flush/service valve at the pre-filter assembly to the "CLOSED" position (center).
- 4) Set the diverter valve on the flow control panel to the sample "TEST" position.
- 5) For the initial start up and after filter changes, set the selector switch on the electrical control panel to the "FEED" position (feed pump only) and purge the system until all entrapped air has escaped.
- 6) In the "AUTO" position, press the "START" button until the pressure on the low pressure gauge "OUT" has build up. If the high pressure pump motor stops, purge the system again and start the system in the "AUTO" position as before.
- 7) Close the pressure control valve slowly clockwise and increae the operating pressure until the specified fresh water output for your model is achieved, not exceeding 800PSI.

Caution: Never allow any leaks in your hose or pipe connections. Do not attempt to re-tighten. Always re-seal with Teflon tape or change O-rings as required.

Caution: Do not attempt to re-seal the stainless steel product water outlet fitting on the membrane vessel end cap by further tightening as this could crack the plug.

Remove the fitting, apply new Teflon tape, insert the fitting and hand tighten plus ¼ turn.

- 8) Check the quality of the product water with the TDS meter. If the water is pure (under 500ppm TDS), switch the diverter valve on the control panel to the "TANK" position.

SYSTEM SHUT DOWN PROCEDURE

- 1) Switch the diverter valve to the "TEST" position.
- 2) Open the pressure control valve all the way counter clockwise.
- 3) Switch the selector switch off.
- 4) Fresh water flush the system (see next page).
- 5) Close the seawater shut off valve on the pre-filter assembly and the seacock.

FRESH WATER FLUSH PROCEDURE

Caution: The fresh water pressure should not exceed the range of the low pressure gauge/s. The installation of a pressure reducer may be necessary.

You should fresh water flush your watermaker after every use or infuse a biocide solution for long term storage. The fresh water flush prepares your watermaker for a shut down period of seven days maximum. You can repeat the flush procedure every seven days, to extend the short term storage.

- 1) Open the pressure control-valve all the way counter-clockwise.
- 2) Close the shut off valve on the pre-filter assembly and make sure the shut off valve on the flush filter is open.
- 3) Open the fresh water flush valve on the pre-filter assembly. Your fresh water pressure pump should now turn on. Allow fresh water to flow until all salt water is flushed out of the system (1-2 mins).
For the next flush procedure, test how long it takes until the brine at the reject outlet of the watermaker becomes fresh (taste or use TDS meter).
- 4) Open the seawater shut off valve and back flush the pre-filter system with fresh water.
- 5) Close the fresh water flush valve, the seawater shut off valve and the seacock.

MEMBRANE STORAGE PROCEDURE

If you intend to store your watermaker for more than ten days, growth of microorganism will degrade the RO membranes performance.

The RO membranes should be flushed with a biocide solution to preserve the membrane for long-term storage of up to ten months.

- 1) Fresh water flush the system.
- 2) In a clean plastic container, mix 5 gallons / 20 litres of un-chlorinated fresh water with 200 grams (2/3 container) of Echo Tec. Preservative # 3.
- 3) Switch the three-way valve to the service position. Switch the diverter valve to the sample position. Switch the shut off valve to the off position.
- 4) Open the pressure control valve all the way anti-clockwise.
- 5) Infuse the storage solution with the service hose connected to the three-way valve while running the high-pressure pump without applying pressure. Press and hold the “START” button with the selector switch in the “OFF” position to run the high pressure pump only. When the solution has been infused, release the start button and remove the pre-filter cartridges for dry storage.

Under best conditions your watermaker is now prepared for a shut down period of ten months.

Discard the product water for at least thirty minutes of initial operation, after storage, before drinking or before use in food preparations.

MEMBRANE CLEANING PROCEDURE

The membranes of the ECHO Tec. Watermaker must be chemically cleaned when the product water output drops by 20% of the specified amount. The frequency of this occurring will vary greatly depending upon feed water. Fouling of the membranes will naturally occur during normal

usage of the ECHO Tec. Watermaker. Increased amounts of fouling without proper cleaning of the membrane will reduce the performance of your water maker. Cleaning of the membranes will not enhance the quality (TDS reading) of the product water.

CAUTION: The use of chemicals or cleaning methods other than those outlined in the cleaning instructions will void the ECHO Tec. warranty. Nonionic surfactants for membrane cleaning or other chemicals not approved in writing by Echo Marine Ltd. will void the element warranty.

CAUTION: Cleaning chemical #1 is an alkaline detergent. See warning label on side of the container and observe all safety precautions on label.

CAUTION: Cleaning chemical #2 is an acid, a mineral scale remover. See warning label on side of container and observe all safety precautions on label.

CAUTION: Do not mix different cleaning chemicals together. Do not use different cleaning chemicals together at the same time. Mix the cleaning chemicals separately and use them separately.

Note: All cleaning and preserving procedures can be done with either sea water or non-chlorinated freshwater. However, the cleaning process is more effective using non-chlorinated freshwater.

To clean the ECHO Tec. reverse osmosis membranes mix one container (330gram) of cleaning chemical #1 with 5gal / 20ltr of water at 104° F / 40° C.

Re-circulate (disconnect the reject water hose and lead it in the cleaning container) the solution **without pressure** for up to 60 min. (observe the maximum operating temperature of 112° F / 45° C). Do not allow the cleaning container to run dry or air to enter the system.

It is important that the fresh water, remaining from the last flush is dumped before the reject hose is led in the cleaning container to ensure the re-circulation of the undiluted cleaning solution only.

Use cleaning chemical #1 first. If the performance does not improve, use the acid cleaner #2 at the same ratio and instruction.

MAINTENANCE TIMETABLE

The following maintenance timetable is an estimate of the time intervals at which maintenance may be required only. This schedule must be adjusted to the regularity of usage, the condition of the intake water, the length of time the system is exposed to seawater and the total running time following each system cleaning.

COMPONENT	MAINTENANCE REQUIRED	TIME INTERVAL INTERMITTENT DUTY
Seawater intake strainer	Inspect and clean intake.	1000 hrs, or when clogged.
Pre filters	Replace or clean elements and clean housings.	When system intake pressure drops below 5psi.
Charcoal flush filter	Replace element.	Every 6 months.
High pressure pump	Change crankcase oil.	Initial change after 50 hrs. Every 200 operating hours or 6 months.
	Change packings, seals and "O" rings.	Every 2000 hrs or when leaking.
R.O. membrane	When production decreases by 20%.	Clean with acid and/or alkaline cleaning compound.
	Replace	When cleaning does not increase production.
Flow meter	Clean inside the clear tube.	Whenever dirty.
	Disconnect product tubing and infuse rust remover. Rinse thoroughly!	

MEMBRANE CHANGING PROCEDURE

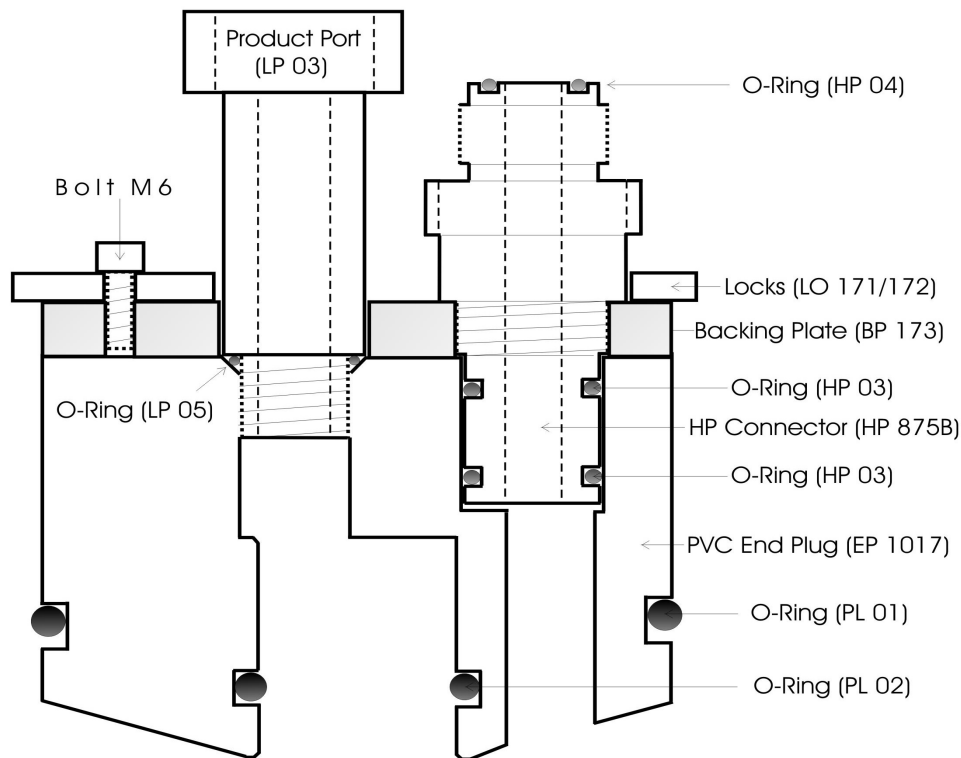
PRESSURE VESSEL END PLUG CHANGING PROCEDURE

- 1) Remove the product port (if installed) and the high pressure fitting.
- 2) Remove the two/three M6 bolts.
- 3) Remove the two/three locking plates (locks)
- 4) Remove the backing plate
- 5) Pull the end plug with the aid of a hand tight inserted product port in one fast pull.

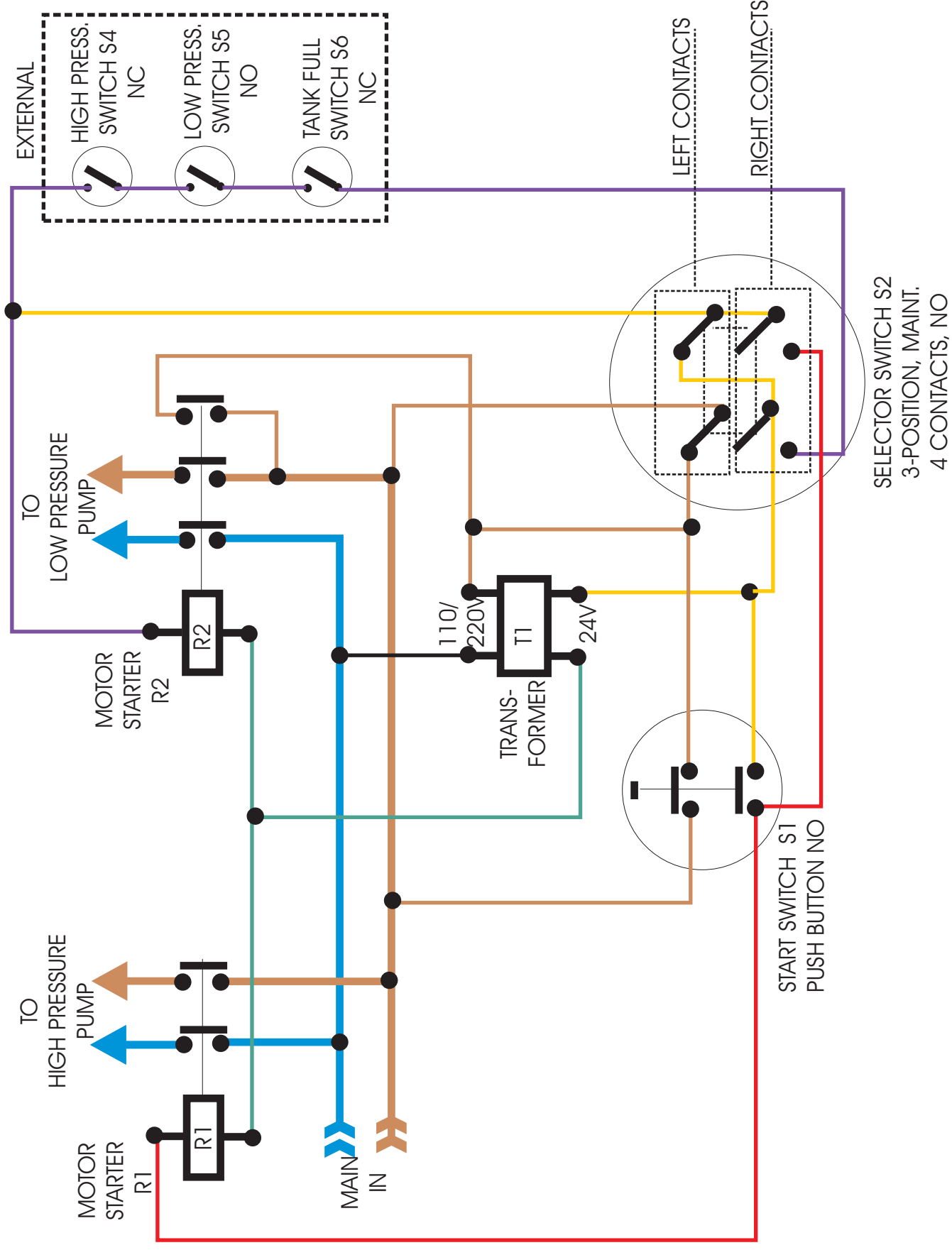
Should the plugs O-ring (PL01) get stuck in the groove of the pressure vessel, it will be more difficult to pull the plug. If the plug gets stuck, tap it in, apply silicone lubricant to the vessel's inner wall and remove it in one fast pull.

- 6) Inspect the end plug for hairline cracks or damages on the O-rings and O-ring grooves.
- 7) Pull the membrane on the product pipe out of the pressure vessel or remove both plugs and push the membrane out (in flow direction!)
- 8) Insert the new membrane observing the correct direction of the lipped seal ring on the high pressure entry side of the membrane (lip against flow direction).
- 9) Clean the product port and end plug threads from remaining Teflon sealant.
- 10) Apply Teflon sealant to the threads of the product port.
- 11) Insert the end plug and reassemble all components visa versa starting with (5).

It is important not to over tighten the product port/s to avoid the end plug to crack.

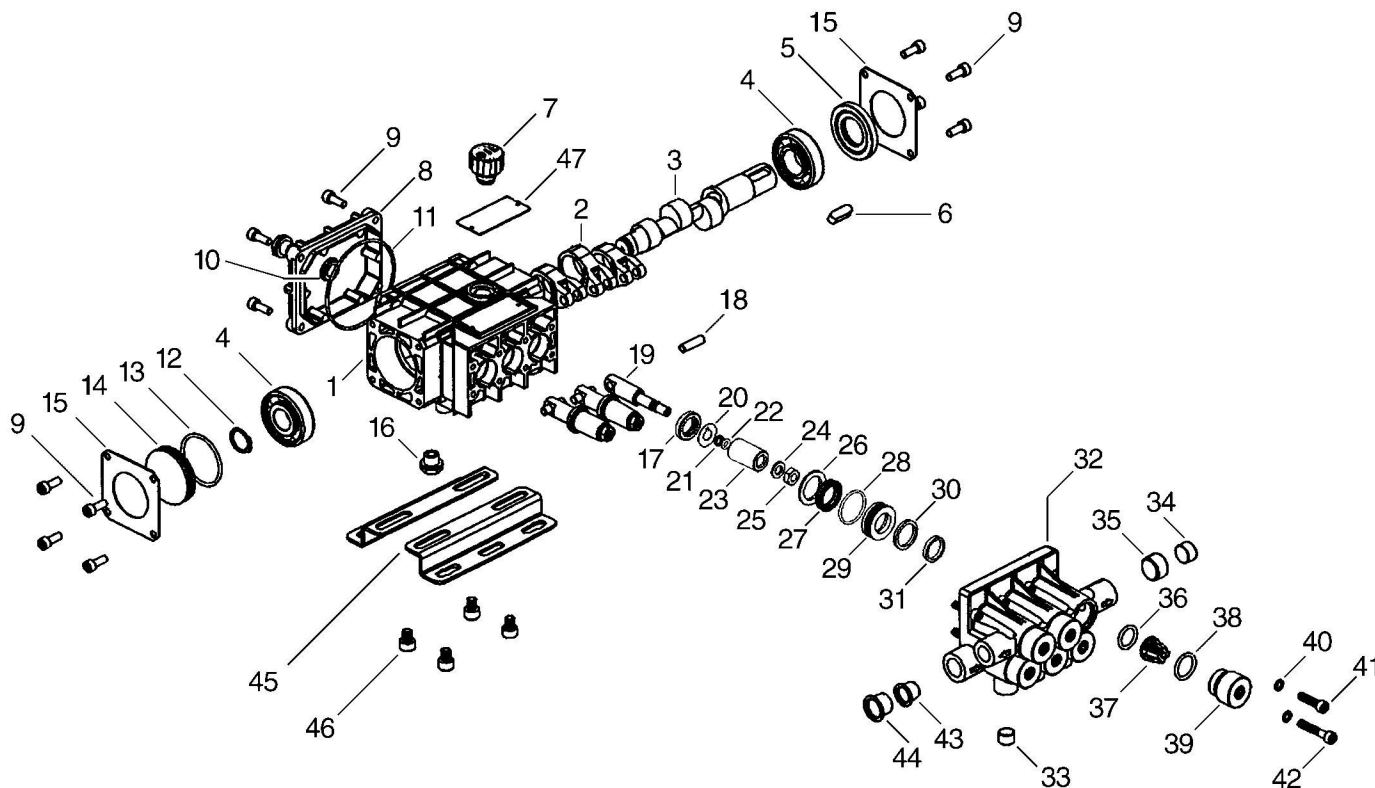


ELECTRICAL DIAGRAM, CONTROL BOX, ECHOTEC. PRO - BHL SERIES, VERSION 2008/03



HIGH PRESSURE PUMP SYSTEM TROUBLESHOOTING GUIDE

MALFUNCTION	CAUSE	REMEDY
The pressure drops	Worn packing seals broken valve spring	Replace seals Replace spring
	Fouled inlet strainer Fouled pre-filter(s) Cavitation	Clean strainer Replace filter cartridge(s) Check suction lines for restrictions
Water in crankcase	High humidity Worn seals	Reduce oil change interval Replace seals
Noisy operating	Worn bearings	Replace bearings, refill crankcase with recommended lubricant
	Cavitation	Check inlet lines for restrictions Check strainer and filter(s)
Inability to build up pressure	Discharge valve chamber has air trapped within it	Allow more time to prime and ensure that there are no air suction leaks. Open valve chambers and allow air to escape
Rough/Pulsating operation with pressure drop	Worn seals	Replace seals Check system for stoppage or air suction leaks
	Cavitation	Check inlet lines for restrictions
Excessive leakage between the high pressure pump manifold and rear crankcase section	Worn plunger(s) Worn seals	Replace plunger(s) Replace seals
	Cracked plunger(s)	Replace plunger(s)
High crankcase temperature	Wrong grade of oil Improper amount of oil in crankcase	Use specified type of oil. Adjust oil level to proper amount



PARTS LIST

ITEM PART NO. DESCRIPTION	KIT NO.	QTY.	ITEM PART NO. DESCRIPTION	KIT NO.	QTY.	ITEM PART NO. DESCRIPTION	KIT NO.	QTY.
1-29. 195022 Crankcase Case Assembly	1		16. 650031 Oil drain plug	1		32. 520055 Manifold		1
1. 650000 Crankcase	1		17. 710002 Oil seal plunger	3		33. 520061 1/4 NPT plug		3
2. 650024 Connecting rod	3		18. 650023 Wrist pin	3		34. 520063 3/8 NPT plug		1
3. 650042 Crankshaft (specify serial number)	1		19. 650020 Plunger rod	3		35. 520062 1/2 NPT plug		1
4. 147004 Bearing	2		20. 650021 Slinger	3		36. 701115 O-ring valve spacer	ETP-01	6
5. 710022 Seal, Oil, Crankshaft	1		21. 660024 Anti-extrusion ring	3		37. 103042 Valve	ETP-01	6
6. 640059 Key	1		22. 701501 O-ring plunger	3		38. 701002 O-ring valve cap	ETP-01	6
7. 650032 Oil Cap	1		23. 650018 Plunger, 18mm	3		39. 520057 Valve plug		6
8. 650026 Rear cover	1		24. 203401 Washer, plunger rod	3		40. 203510 Washer, ribbed lock		8
9. 200003 Screw, SHCS 20mm	12		25. 203000 Nut, plunger rod	3		41. 200025 Screw, SHCS, 25mm		4
10. 650025 Sight Glass	1		26. 660053 Seal retainer	ETP-02	3	42. 200026 Screw, SHCS, 35mm		4
11. 701610 O-Ring, rear cover	1		27. 710012 Low pressure seal	ETP-02	3	43. 145029 Plug, cap #7		1
12. 650043 Snap ring	1		28. 701023 O-ring seal case	ETP-02	3	44. 145030 Plug, cap #9		1
13. 701133 O-ring, oil seal retainer, side cover	1		29. 660054 Seal case	ETP-02	3	45. 540049 Rail (optional)		2
14. 650010 Side cover	1		30. 710011 Square ring, high press. seal	ETP-02	3	46. 200047 Screws, M8x1.25X10mm		4
15. 650009 Side plate	2		31. 710010 Glide ring, high press. seal WM02	3		47. 604040 Label		1

REPAIR KITS

KIT NO.	ETP-02	ETP-01
ITEM NO.s INCLUDED IN KIT	26, 27, 28, 29, 30, 31 *	36, 37, 38
NUMBER OF ASSEMBLIES IN KIT	3	6

TORQUE SPECS

Position	Ft.- lbs.
9	7.3
25	7.3
39	3.5
41	8.0
42	8.0

*Includes 660062 and 660063 seal installation tools.

ECH₂O TEC. WATERMAKER LIMITED WARRANTY

Echo Marine Ltd. warrants to the original purchaser for a period of twenty-four (24) months from the date of shipment that the ECHO Tec. watermaker will perform according to specifications. The triplex plunger high-pressure pump and the high-pressure vessel/s are guaranteed for five years to the original purchaser. Echo Marine's liability under this warranty shall be limited to repair or replacement of the ECHO Tec. watermaker at Echo Marine's option. Under no circumstances shall Echo Marine Ltd. be liable for consequential damages arising out of or in any way connected with the failure of the system to perform as set forth herein. This limited warranty is in lieu of all other expressed or implied warranties, including those of merchantability and fitness for a particular purpose.

In the event of a defect, malfunction, or failure during the warranty period, Echo Marine Ltd. will repair or replace, at its option, the product or component therein which, upon examination by Echo Marine, shall appear to be defective, or not up to factory specifications.

To obtain warranty service, the defective product or part must be returned to Echo Marine's Service Center. The purchaser must pay any transportation or labor expenses incurred in removing and returning the product. A return authorization must be obtained before any part or component is shipped.

The limited warranty does not extend to any system component which has been subjected to misuse, neglect, accident, improper customer installation, or used in violation of instructions furnished by Echo Marine Ltd. The warranty does not extend to components on which the serial number has been removed, defaced or changed.

Echo Marine Ltd. reserves the right to make changes or improvements in its product during subsequent production without incurring the obligation to install such changes or improvements on previously manufactured equipment.

The implied warranties, which the law imposes on the sale of this product, are expressly LIMITED, in duration to the time period above. Echo Marine shall not be liable for damages, consequential or otherwise, resulting from the use and operation of this product or from the breach of this LIMITED WARRANTY.

This limited warranty service does not apply to normal recurring user maintenance as described below.

Sea Strainer Element
Pre-filter Cartridges
Auxiliary Tubing
Pump Seals and Packings
Pump Bushings and Bearings

Pump Valve Assemblies
Gauge Instrument Calibration
Pump Crankcase Oil
V or Timing Belt

The ECHO Tec. Membrane Element is guaranteed to be cleanable for a minimum of one year from date of shipment, or commissioning of the system by Echo Marine Ltd, provided that cleaning instructions are adhered to and foulant is acid soluble metal hydroxides and calcium carbonates or alkaline soluble organic, inorganic substances and microbiological slimes. The ECHO Tec. Membrane Element is not guaranteed against iron fouling (rust), chemical attack, extreme temperatures (over 113° F/under 33°F), drying out, or extreme pressures (over 1000 psig).

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